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# Description

## Redetachable, self-adhesive device

The invention relates to a redetachable, self-adhesive device which can be released again from its adhesive bond without leaving any residue by pulling on the adhesive film, arranged on it, in the direction of the bonding plane. In particular, the invention relates to a plate of this type, on which other things can be fastened if appropriate, or which itself is designed as a hook or the like if appropriate.

Such devices, in particular hooks, are known. For instance, DE 42 33 872 C2 describes a redetachable, self-adhesive hook which is equipped with an adhesive film which can be adhesively released by pulling and which is commercially available as "tesa® Power-Strips with Hooks". A so-called system hook with base plate and attachable decorative hook is also commercially available as the tesa® Power Strip System Hook.

WO 94/21157 also discloses such a hook, which differs from the abovementioned hook in particular by the use of an adhesive film of the kind which is highly extensible and at the same time does not recover its original form.

In the practical use of such devices, problems may occur, however, in particular during later detachment.

What is particularly disadvantageous about the previously known problem solutions is that the releasing of the adhesive bond has to take place by pulling the adhesive strips substantially in the bonding plane, errors in use being inevitable for the unexperienced us r.

In many cases it has been found that tears are

caused by the user exerting considerable force to press the item to be released against the object to which it is adhesively bonded during the releasing process. As a result, the force necessary for pulling the adhesive tape out of the adhesive joint is increased to such an extent that the tearing resistance is exceeded, with the unfortunate consequence for the user that the adhesiv tape tears and the adhesive bond can no longer be released non-destructively and without leaving any residue.

The object of the invention was to overcome the aforementioned disadvantages.

This object is achieved by means of a device such as that characterized in more detail in the claims. Accordingly, the invention relates to:

A redetachable, self-adhesive device having a plate, the sides and/or front side of which have fastening means, if appropriate, and the rear side of which has a strip of an adhesive film which is adhesive on both sides and is adhesively attached in such a way that one end of the adhesive film protrudes beyond the plate as a grip, the adhesive film being of such a kind that the adhesive bond achieved with it can be released again by pulling in the direction of the bonding plane, stretching the strip, characterized in that the rear side of the plate (1) has laterally alongside the adhesively attached adhesive film (5) spacers (3A, 3B), the height of which is less than the thickness of the adhesive film (5).

In particular a device according to Claim 1, characterized in that the spacers (3A, 3B) are located on both sides alongside the adhesively attached adhesive film (5).

In particular a device according to Claim 1, characterized in that the spacers (3A, 3B) are formed as fillets or segments.

In particular a device according to Claim 1, characterized in that the spacers (3A, 3B) are arranged on both sides and, on each of these sides, at least in

the region of the two ends.

In particular a device according to Claim 1, characterized in that it is formed as an injection-moulded part of plastic.

In particular a device according to Claim 1, characterized in that the height of the spacers (3A, 3B) is 35 - 90% of the thickness of the adhesive film (5), in particular is 0.3 - 0.6 mm in the case of a thickness of the adhesive film (5) of 0.65 mm.

In particular a device according to Claim 1, characterized in that the adhesive film (5), with or without an intermediate substrate, is elastically or plastically extensible.

In particular a device according to Claim 1, characterized in that the adhesion of the adhesive film (5) is less than the cohesion, the adhesiveness is dissipated to a great extent when the film is extended, and the ratio of pulling-off force to tearing load is at least 1:1.5, the adhesive film being of the kind which is based on thermoplastic rubber and tackifying resins, with high elasticity and low plasticity.

In particular a device according to Claim 1, characterized in that the rear side of the adhesive film (5) is covered with a release laminate, such as a siliconized release paper or a release film.

In particular a device according to Claim 1, characterized in that at the sides of the plate (1) there are engaging devices (4) into which a corresponding hook or the like can be engaged.

The height of the spacers is advantageously chosen such that it is less than the thickness of the (unstretched) adhesive film, so that a satisfactory adhesive bond with the adherent surface is possible. The extension of the adhesive film occurring during the detachment operation causes the said film to be reduced correspondingly in width and thickness. If the thickness of the adhesive film reached during detachment is less than the height of the spacers, detachment of the adhesive film without tearing is even possible if high

contact pressures occur at the same time vertically to the adhesive bond, which would otherwise have lead to tearing of the adhesive tape.

According to the invention, suitable in particular as adhesive films are those corresponding to DE 33 31 016, DE 42 22 849, DE 42 33 872, WO 92/11333 and WO 94/21157.

For instance, DE 33 31 016 A1 describes an adhesive film for re-releasable adhesive bonds which allows an adhesive bond established therewith to be released by pulling on the adhesive film in the direction of the bonding plane. With such adhesive films, high adhesive forces and shear strengths can be achieved and adhesive bonds can be released again without further aids, in a way comparable to the opening of a preserving jar, similar to the way in which there the rubber seal is pulled by the grip out of the seal joint.

DE 42 22 849 C1 describes such an adhesive film with a UV-impermeable grip.

WO 92/11333 also describes, inter alia, adhesive films for corresponding applications, the adhesive films used having a low elasticity with at the same time high extension.

Double-sided self-adhesive tapes with a foam intermediate substrate, for example of polyethylene foam, can also be used according to the invention.

In general, for production, processing and handling of the particularly preferred adhesive films, reference is made to DE 33 31 016, DE 42 22 849 and WO 92/11333.

Suitable as the material for the plate or moulding, in particular for base plates, are:

Plastic, metal, wood (coated, for example painted, and uncoated), ceramic and the like.

Devices according to the invention serve for receiving one side of the adhesive film, the other side of which is adhesively bonded onto the selected underlying surface. A wide variety of adapters, including hook bodies, can be placed onto the device or plate. To

produce a high bonding strength, the surface of the plate on the side to which the adhesive film is applied consists in particular of a material which has an adhesion with respect to the adhesive film which is adequate for the respective application. When using contact adhesives based on styrene block copolymers or acrylate copolymers, advantageously used in this case are, inter alia, polystyrene, impact-modified polystyrenes, PMMA, aromatic polyesters, polycarbonate or polyamide.

To accomplish a pulling-off behaviour without tearing, even under the effect of high forces acting perpendicularly with respect to the bonding plane (for example caused by high contact pressure when releasing the adhesive bond), the plate is equipped with spacers (for example fillets), as still to be described in detail, on the side which bears the adhesive film.

Spacers may be provided on both sides alongside the adhesive film over the entire length of the base plate, or else only in certain subregions thereof. Specific formations, right-angled fillet-like, rounded-off fillet-like, punctiform etc., are possible.

Tests with different redetachable adhesive films show that, depending on the type and structure of the adhesive films used, typical stripping extensions lie between 100% and 800%. In practice, it is found that, in the case of substantially rubber-elastic adhesive films, the height of the spacers should be at least about 0.05 mm, preferably 0.10 mm, higher than the thickness of the stretched adhesive films during the detachment process. For a reliable adhesive bond, on the other hand, the spacer height should be kept about 0.05 mm, preferably 0.1 mm, particularly preferably 0.15 mm, less than the thickness of the adhesive films in the non-stretched state. The values specified relate to planar, solid adherent surfaces. In the case of rough and/or slightly deformable adherent surfaces, values higher than those quoted may be advisabl both for a satisfactory bonding process (ad quate contact pressure) and for

satisfactory redetachment.

The invention is to be explained in more detail below with reference to exemplary embodiments, without however wishing to restrict it unnecessarily. In the drawing:

Fig. 1 shows an obliquely lateral view of a device according to the invention,

Fig. 2 shows a side view according to Fig. 1, with an adhesively attached adhesive film strip,

Fig. 3 shows an end view according to Fig. 1,

Fig. 4 shows a side view according to Fig. 2, the device being adhesively attached by its adhesive film strip to an object, and

Fig. 5 shows an end view according to Fig. 4.

To be specific, Fig. 1 shows a plate 1 with a rear side 2, which serves for receiving a strip of double-sided adhesive film and has spacers 3A, 3B in the form of fillets to the sides of the adhesive film to be adhesively attached. On its sides, the plate 1 also has engaging devices 4, into which a corresponding device can engage, for instance a plate with a hook or some other fastening device, as is standard and commercially available.

Fig. 2 shows how a strip 5 of an adhesive film is adhesively attached to the plate 1, it being indicated by the dotted line 6 how the spacers 3A and 3B partially enclose the strip 5 to the sides, while one end of the adhesive film protrudes beyond the plate 1 as a grip 7. In Fig. 3, as an end view of the plate 1, the latter is represented with the spacers 3A, 3B and also with the engaging devices 4.

Fig. 4 shows in a lateral view how such a device is adhesively attached to an object 8, for instance a wall, a door or a cupboard, with plate 1, strip 5 of an adhesive film, the grip 7 protruding beyond one end of the plate 1, the grip 7 being made non-adhesive by thin films 9A, 9B. In Fig. 5, this arrangement is represented in an end view, with plate 1, strip 5 of an adhesive strip, and also spacers 3A, 3B which laterally enclose

the strip 5 and extend to about half the thickness of the strip 5.

**Example**

For a single-layer adhesive film of the following formulation:

- 50 parts of Foralyn 110 (Hercules), 50 parts of Vector 4211 (Exxon Chemical), 0.5 parts of Irganox 1010 (Ciba)

of a thickness of 650 µm, a maximum tensile force of 52 N/cm, corresponding to 8.0 MPa, and an ultimate elongation of 1300% are determined.

Rectangular pieces of the adhesive film measuring 20 mm x 50 mm are adhesively bonded centrally to base plates consisting of steel of the dimensions 3 mm x 40 mm x 22 mm (height x length x width) in such a way that the base plates are covered on one side over their entire length by the adhesive film and a 10 mm long strip of adhesive film protrudes beyond one of the short sides of the base plate, which can be used as a grip for later detachment. The base plates are provided on both longitudinal edges on the side to which the adhesive films are applied with spacers 0.5 mm wide and of different heights. The base plates provided with adhesive films are adhesively bonded onto a planar underlying surface of Resopal. For this purpose, the base plates provided with the adhesive films are applied flatly to the underlying Resopal surface and pressed onto it with 500 N for 5 seconds. In a second operation, for detaching the adhesive films, the test pieces fixed in this way are subjected to a force of likewise 500 N, acting vertically onto the bonding plane, and then the adhesive film strip is pulled out of the adhesive joint at an angle of $< 10°$ with respect to the bonding plane. For comparison, the tests are carried out without any force acting vertically on the bonding plane. The stripping rate in all the tests is about 1000 mm/min. The following results are obtained.

| Height of the spacers | Vertical pressing force 500 N | Without vertical force |
|---|---|---|
| No spacer | Strip tears | Can be detached without tearing |
| 0.3 mm | Can be detached without tearing | Can be detached without tearing |
| Stripping force* | 10//14 N/cm | |
| 0.4 mm | Can be detached without tearing | Can be detached without tearing |
| Stripping force* | 9//15 N/cm | |
| 0.5 mm | Can be detached without tearing | Can be detached without tearing |
| Stripping force* | 9//10 N/cm | |
| 0.6 mm | Can be detached without tearing | Can be detached without tearing |
| Stripping force* | 9//10 N/cm | |
| 0.7 mm | No adhesive bonding possible | No adhesive bonding possible |

* Mean value//maximum value (the maximum value is reached at the end of the stripping operation).

Under the chosen test conditions, only base plates provided with spacers can be detached again without tearing under the effect of high vertical forces acting on the base plate.